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College of Agriculture, West Virginia University

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Morgantown

The Farm Tractor in Mason and Berkeley Counties

The Greatest Factor in Successful Tractor Work Was An Efficient Operator.

BY

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The Farm Tractor in Mason and Berkeley Counties

The farm tractor has become one of the most important factors in modern farm practice. The development of its use has reached such a stage that farmers generally are beginning to desire to know, "Under what conditions is it practical and economical to invest in a farm tractor?"

In order to give the farmers of West Virginia definite information regarding this problem that now confronts them, a tractor survey of two farming sections was made in the summer of 1921. Personal visits were made to the farms in these sections on which tractors had been in operation for at least one year. A total of sixty complete records of tractor operations and costs was taken. The information contained herein was obtained by summarizing the data secured from the farmers who have had actual experience with the tractor on the farm.

The general conditions of these 60 farms from which the records were taken are such as to make the experiences of these tractor owners of value to other farmers in the State who contemplate the purchase and operation of tractors on their own farms. While the farms from which the records were taken contain considerably more level land than does the average West Virginia farm, there are a great many farms in the State on which tractors can be used with as satisfactory results as on these sixty.

The areas of Mason and Berkeley counties, in which the farms included in the survey are located, differ in topography and in soil texture. The surface of Mason County uplands is very broken and consists of narrow ridges and steep hillsides. The ridges frequently broaden out, however, into small plateaus or more rounded hills with gently sloping sides. The valleys along the larger streams vary from one-fourth to one mile in width. The soil of the uplands is largely clay, much of the surface being clay loam. The soil along the streams is silty loam and sand. Tractors in this section are

Plowing a Heavy Sod Eight Inches Deep. The Tractor Plowed 5.84 Acres per Day With a Two-plow Outfit at a Cost of Approximately Eighty Cents per Acre, Exclusive of Labor.

used in general farming enterprises and perform a variety of farm operations.

The surface of Berkeley County varies greatly. Much of the land is gently rolling to level. In general, the soil is similar to that in the rest of the Shenandoah Valley and is mostly of limestone formation. The outcropping limestone hinders and almost prevents tillage in some places. Tractors in this section are used largely in the cultivation of orchards. No soil survey of Berkeley County has been made.

The tractor was first used for field work in West Virginia about seven years ago. Before that time steam tractors were used in moving and operating threshing machines and in doing other heavy work. In January, 1918, there were 100 tractors in the State; at the present time there are approximately 600 in actual use on farms.

There were 69 tractors on the 60 farms studied. All of these were of the smaller type. The smallest was rated as 8-16 horsepower and the largest 12-25. Each of the tractors pulled two plows and under very favorable conditions some pulled three. There were 25 International Harvester tractors, 23 Fordsons, 8 Clevelands, 3 Sampsons, 3 Molines, 3 Cases, and 1 each of LaCrosse, Huber, Avery, and Waterloo Boy.

SIZE OF FARMS ON WHICH TRACTORS WERE USED

Most of the tractors were used on large or medium large farms. The smallest farm on which a tractor was used was 60 acres.

TABLE 1.—Size of Farms on Which Tractors Were Used

Make of Tractor	Rating in Horse Power	No. Tractors on Farms of Different Sizes				Total No. of Tractors
		150 Acres or Less	151-250 Acres	251-500 Acres	More than 500 Acres	
Fordson	10-20	4	11	5	3	23
International	8-16 10-20	1	6	7	11	25
Cleveland	12-20	2	3	2	1	8
Sampson	*	1	2	0	0	3
Moline	9-18	0	1	0	2	3
Case	10-18	0	2	1	0	3
LaCrosse	12-24	1	0	0	0	1
Huber	12-25	0	0	1	0	1
Avery	8-16	0	0	0	1	1
Waterloo Boy	12-25	0	0	0	1	1
Totals		9	25	16	19	69

*Not rated in terms of horse power.

There were but 4 tractors used on farms of less than 100 acres, 9 on farms of less than 150 acres, 25 on farms of 151 to 250 acres, 16 on farms from 251 to 500 acres, and 19 on farms larger than 500 acres; 14 of the 19 tractors were used on ten farms of more than 1,000 acres each. The operators of tractors on the smaller farms, in addition to using them for farm work, used them in performing various kinds of work off the farms.

KINDS OF WORK DONE BY TRACTORS

The uses to which the tractors were put were many and varied. There were a few farm operations for which the tractor seemed particularly adapted and in which it excelled other types of farm power. The reasons the farmers gave for this were that these kinds of work could be done with the tractor, not only as well as, or better than, with horse power, but could be performed much more rapidly.

TABLE 2.—Field Work Done by Tractors on 60 Farms

Kinds of Work	No. of Farms	Average Acreage per Farm	Average Acreage per Tractor	Ave. Acreage per Day per Tractor	Ave. No. Days Each Tractor Worked	Total No. of Tractors
Plowing	48	68.3	59.6	5.8	10.0	55
Fitting	52	245.7	209.4	16.3	14.8	61
Binding grain	30	....	....	....	2.9	36
Loading hay	9	....	....	....	3.1	12
Haul. manure	5	....	....	....	6.0	5
Mowing	4	25.5	20.4	10.7	1.6	5

Tractors were used considerably more for fitting than for other field operations. They were used extensively in fitting orchards where but little plowing was necessary. Each tractor plowed an average of 5.8 acres per day and worked 10 days, while 16.3 acres were fitted per day and each tractor worked an average of 14.8 days fitting. The number of days spent at other work was much less. But few days were required for harvesting when large machines were used. In a few instances tractors were used for such work as pulling stumps, pulling trees, digging ditches, and hauling sprayers.

The tractor in West Virginia is not used extensively off the farm where it is owned. Where it is, however, it performs various operations, the most important of which are threshing, filling silos, sawing wood, and doing road work.

TABLE 3.—Work Done Off the Farm by Tractors

Kinds of Work	No. of Farms	No. of Tractors	Ave. No. Days Each Tractor Worked
Plowing	4	4	5.7
Fitting	2	2	4.5
Filling silo	8	8	4.8
Road work	5	7	8.0
Threshing	3	3	24.8
Hauling logs	1	1	5.0
Binding grain	1	1	4.0
Baling	1	1	63.0

Eight tractors were used for filling silos off the home farms. This number was more than was used for any other operation. Seven tractors from 5 farms did road work, 4 tractors did plowing, and 3 threshing. Only 1 tractor did any other kind of work.

The most important of the operations in which the tractor seemed to excel horse labor were plowing and fitting. The advantages of tractor plowing were in the rate of doing the work and in the depth of plowing. The average amount of land that was plowed with the tractor was 5.84 acres per day. This area compared to the average of about 1.4 acres that can be plowed with a team gives the tractor a decided advantage over horse power in the amount of land per man that can be worked in a given time. The much larger area that can be covered with the tractor per day also makes possible the working of the land at a time when conditions are the most favorable for the operation. The average depth plowed by tractor power was 8.44 inches as compared to an average depth of 6.77 inches with horses.

The adaptability of the tractor to different kinds of belt work is one of its chief assets for use on the farm. It furnishes sufficient power in nearly all cases where belt work is required. At the same time it is compact, easily set up, and can be quickly moved from place to place under its own power. The following table gives a summary of the belt work done by the tractors on the farms from which records were obtained.

TABLE 4.—Belt Work Done by Tractors

Kinds of Work	No. of Farms	No. of Tractors	Ave. No. Days Each Tractor Worked
Threshing	11	13	3.0
Filling silo	25	30	3.4
Grinding feed	20	23	9.0
Sawing wood	19	21	3.3
Shredding	12	16	7.2
Baling	4	5	8.6
Milking	1	1	128.0

On several farms the tractor was used as many days for belt work as for field work. Filling silos, grinding feed, sawing wood, shredding, and threshing were the more important belt operations for which the tractors supplied the power. The use of the tractor for belt work has eliminated to a great extent the necessity for other engines adapted to belt work alone. It has also furnished power for performing many kinds of work on the farms which some farmers had not been accustomed to doing before, owing to lack of equipment. Such operations as grinding feed, filling silos, and power sawing of wood might be included in this list.

COST OF OPERATING A TRACTOR

The matter of additional cost for an operator for the tractor seems to have been almost a negligible consideration. Of the farms visited only one farmer was found who paid increased wages as a result of using a tractor. In 29 cases the tractor was operated by the farmer himself; on 13 farms the son or some other member of the family operated the tractor; and in 10 cases the tractor was operated by hired labor. Of these operators only one had ever attended any kind of a tractor school. These facts indicate that the cost of man labor required for the tractor does not appreciably exceed that for other farm labor.

The expense of operating a tractor lies principally in the cost of fuel and oil, depreciation, interest on investment, and repairs. The accompanying table shows the average costs of these items as determined by the survey.

TABLE 5.—Cost of Operating a Tractor

Costs	No. of Tractors	Cost per Day Tractor Was Used
Gas, oil, grease, and kerosene, including delivery	56	$3.36
Depreciation	29	2.26
Interest on investment	33	1.13
Upkeep, repairs, including new parts	38	.80
Miscellaneous costs	....	.36
Total		$7.91

Cultivating the Orchard by the Use of the Tractor and Double Disc.

Labor costs of operating the tractors are not considered in the foregoing table since labor for operating tractors costs no more than for other farm work. The yearly interest, depreciation, and miscellaneous costs are distributed over the time the tractor was used. It is customary to deliver gas and oil to the farms in many places; this delivery cost is included in the cost of gas and oil. It required approximately 2.1 gallons of gasoline or 2.7 gallons of kerosene to plow an acre. The tractors that had service easily accessible gave better satisfaction than those that did not. The average number of days each tractor worked was 41.66, while some tractors were used more than 100 days. Since depreciation, interest, and miscellaneous costs are constant, the more days the tractor works the less these costs per day. However, if the tractor is worn out in a short time, depreciation charges will be high. Other costs generally depend upon the amount of work done.

All but four of the farmers bought additional equipment to use with tractors. Plows were bought with the tractors on most farms but other equipment designed for use with horses was used on several farms. Six farmers sold some farm equipment after buying a tractor. The farmers claimed that the use of special equipment for the tractor would make its use more general and give better results.

The annual depreciation on tractors was figured with reference to the price of the tractors at the time they were purchased. This makes the figure somewhat higher than it would be at present prevailing prices.

TABLE 6.—Depreciation on Tractors

Make of Tractor	No. of Tractors	Average Cost New	Estimated No. of Years Tractor Will Last	Annual Depreciation
Fordson	10	$ 769.50	9.3	$ 82.85
International	16	1,057.50	9.7	109.01
Cleveland	7	1,362.14	10.3	132.25
Sampson	3	916.66	7.7	119.67
LaCrosse	1	1,000.00	10.0	100.00
Moline	1	950.00	10.0	95.00
Case	2	1,125.00	8.0	128.12
Average	40	$1,027.49	9.5	$108.15

The cost of the tractor and the length of time it will last determine the annual depreciation. The estimated depreciation on the Fordson tractor was the lowest, $82.85, and on the Cleveland the highest, $132.25. The Fordson was the lowest priced tractor and the Cleveland the highest priced. Since but few tractors had been worn out, the length of time they can be used is yet undetermined.

The tractor has not been used on the farms in this State long

A Small Tractor Furnishes the Necessary Power for Filling a Large Silo.

enough to have had any very great effect upon production. Fifteen of the 60 farms reported an increase in crop yields after using the tractor; 45 reported no appreciable change.

The average area of land on 59 of the 60 farms was 232 acres. Of these 59 farms, 47 were operated by owners and 12 by tenants. Apparently more owners than tenants were using tractors at this time.

Because of the topography of the State it is impossible, in a great number of cases, for the farmer to shape his fields as he would like. The general tendency, however, is to have the fields square or rectangular. Of 56 farms giving these data, 23 had the fields arranged as nearly square as possible; on 14 the fields were rectangular; and on 19, due to conditions over which the farmer had no control, the fields were irregular. The shape of the fields did not seem to have been a result of the use of the tractor. Of the 55 farms, only 5 had changed the layout of the fields since using the tractor, while 50 had not. Neither had the tractor been responsible for any appreciable increase in the size of the farms since only two of the tractor owners visited had increased the size of their farms, while one had decreased his farm in area of tillable land.

The average number of days of hired labor and unpaid family labor was not greatly changed by the use of the tractor. Although the tractor saved time there was always plenty of work to keep the hired help busy. The result was a general tendency toward the improvement of farm conditions.

HORSE AND TRACTOR LABOR

A great difference was noted in the number of days of horse labor before and after using the tractor. The total amount after using the tractor was about one-third of that before using it. This means that fewer horses were necessary to do the farm work. The maintenance cost per horse was also considerably less since the horses did not need to be fed so heavily when not working and pasture was utilized to a much greater extent. The average number of horses on the farms before using the tractor was 8; the average number on the farms the year of the survey was 5.2; the average number of horses necessary to do all the farm work would be 8.2.

The average cost of keeping a horse before buying the tractor was $104.40 as compared to an average of $80.33 the year of the survey on the basis of the same feed prices. This shows a decrease of $24.07 in the cost of keeping a horse a year. The average value of the horses kept before using the tractor was $150.00; the year of the survey it was $128.33. The average weight of the horses kept before buying the tractor was 1,308 pounds; the year of the survey it was 1,247 pounds. These figures show that a lighter and cheaper type of horse satisfied the requirements when a tractor was used for most of the heavy work.

Of the 60 farmers interviewed, 33 said the horses were idle while the tractor worked; 15 said they were not idle while the tractor worked; and 12 said they were idle part of the time.

An estimate was secured from each farmer as to the minimum size of farm on which a tractor could profitably be used. An average of these estimates showed 91.36 acres under cultivation for general farming, and 34 acres for orchard enterprises.

Whether the tractor on the farm in West Virginia was an economic investment depended upon the particular farm. The test of the tractor was in its performance. Only 3 out of 60 owners were dissatisfied; only 6 would now farm without a tractor (which number includes the three dissatisfied owners); while 54 would not farm without a tractor, in fact, "could not get along without it."

ADVANTAGES AND DISADVANTAGES OF TRACTORS

Among the advantages given for the use of the tractor were:

1.—A greater variety of heavy work could be done with the tractor.
2.—The work could be done both quicker and better.
3.—The tractor could be used for pulling trees and small stumps.
4.—Less hired labor was needed when a tractor was used.
5.—The tractor was particularly adapted to cultivating orchards.
6.—The tractor did odd jobs which horses could not do.
7.—The tractor worked well for heavy hauling on frozen ground.
8.—The tractor was not affected by heat and it could work long hours.

Among the disadvantages given for the use of the tractor were:

1.—One could not plow rough, steep, nor stony land with a tractor.
2.—The tractor did not turn feed into fertilizer.
3.—It packed the soil, especially if it were wet.
4.—Horses did better work than tractors.
5.—One must feed horses anyway, and they can do the farm work.
6.—Use of tractors stopped the sale of farmers' hay and grain.
7.—Tractor repairs and the delay while waiting for them were too expensive.

Some of the disadvantages, if they exist at all, can be easily overcome on many farms, and some of both advantages and disadvantages may be imaginary, or exist only on particular farms.

SUMMARY

1.—Tractors ranging from 8-16 to 12-25 horse power and designed to pull two 14-inch plows were used almost entirely.
2.—The cost of operating a tractor was $7.91 per day, exclusive of operating labor.
3.—The tractor plowed 5.84 acres per day with a 2-plow outfit at a cost of approximately $1.35 per acre, exclusive of labor.
4.—It required approximately 2.1 gallons of gasoline or 2.7 gallons of kerosene to plow an acre.
5.—Tractor power was a substitute for only a part of the horse power on the farm.
6.—The greatest factor in successful tractor work was an efficient operator.
7.—Tractors were operated by farmers, their sons, and hired men, not by professional operators of tractors.
8.—No injurious packing of soil was caused by the wheels of the tractor when the soil was in proper condition to be worked.
9.—Tractors which had service stations easily accessible gave the greatest satisfaction.
10.—With proper care tractors should last from eight to ten years as they are ordinarily used.
11.—Tractors were used an average of 41.66 days per year.